FLOOD PLAIN INFORMATION

ROARING BROOK

AVON
CONNECTICUT

TECHNICAL REPORT

This study authorized under Section 206, Public Law 86-645, was requested by the Town.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

OCTOBER 1966

FLOOD PLAIN INFORMATION
ROARING BROOK
AVON, CONNECTICUT

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INTRODUCTION

1. GENERAL

The town of Avon has requested the assistance of the Corps of Engineers, U. S. Army in determining the limits of the flood plain that may be regulated along Roaring Brook to reduce future flood damages.

2. AUTHORIZATION

Upon application to the Chief of Engineers, Washington, D. C. authority was granted to the New England Division, Corps of Engineers to prepare this flood plain information report under the general authority conferred on the Chief of Engineers by Section 206, Public Law 86-645 (approved July 1960), which reads:

> "SEC. 206 (a) That, in recognition of the increasing use and development of the flood plains of the rivers of the United States and of the need for information on flood hazards to serve as a guide to such development, and as a basis for avoiding future flood hazards by regulation of use by States and municipalities, the Secretary of the Army, through the Chief of Engineers, Department of the Army, is hereby authorized to compile and disseminate information on floods and flood damages, including identification of areas subject to inundation by floods of various magnitudes and frequencies, and general criteria for guidance in the use of flood plain areas; and to provide engineering advice to local interests for their use in planning to ameliorate the flood hazard; Provided, That the necessary surveys and studies will be made and such information and advice will provide for specific localities only upon the request of a State or a responsible local governmental agency and upon approval by the Chief of Engineers."

This report has been reviewed and approved for release by the Connecticut Water Resources Commission and the Chief of Engineers, Washington, D. C.

3. PURPOSE OF THE STUDY

The purpose of this study is to describe the flood situation along Roaring Brook in the town of Avon and to provide information to aid:

a. In establishing a basis for zoning and other regulation measures relative to the development in the flood plain.

b. In the solution of local flood problems.

c. In the best utilization of lands subject to overflow.

The dissemination of the information to all interested parties will provide a basis for further study, planning and action in alleviating existing flood problems and in avoiding or reducing future flood problems likely to be associated with increased development of the flood plain areas. It will provide technical advice to make possible optimum economic use of the flood areas based on carefully considered local judgment and exercise of control on development of such areas. Finally this report is intended to encourage those affected to help themselves. Additional details and basic data are available for inspection at the New England Division office.

4. SCOPE OF STUDY

The limits of the study area extend along Roaring Brook from the Avon-Canton town line to the Avon-Farmington town line, a distance of 4.4 miles. The flood of August 1955 and three smaller synthetic floods were used as a basis for determining the flood damage potential along Roaring Brook. Profiles and the extent of flooding have been indicated on exhibits included in this report.

5. USE OF STUDY

The depth of flooding may be ascertained from the maps, profiles and cross sections. From this data future development may be planned with due recognition of the chance and hazards of flooding.

6. It is not intended to extend any Federal authority over zoning or other regulation of flood plain use and the report is not be be construed as committing the Federal Government in the future to investigating, planning, designing, constructing, operating or maintaining any facilities discussed or to imply any interest to undertake such activities unless specifically authorized by Congress.

7. It is the responsibility of the state and local agencies to disseminate the information in this report to planning groups, zoning boards, private citizens, engineering firms, business firms, real estate developers, banks and industries. Additional copies of this report may be obtained at the Planning and Zoning Office, Town of Avon.

8. ACKNOWLEDGMENT

Appreciation is extended to all of the individuals who were helpful in developing the field data. The cooperation and assistance of other Federal and non-Federal agencies in observing, collecting and compiling

the information contained herein is also appreciated. Some of these agencies are as follows:

U. S. Geological Survey
U. S. Weather Bureau

State of Connecticut Water Resources Commission
State of Connecticut Highway Department

Town of Avon Administrative Officers
Town of Avon Highway Department

9. CONTINUED ASSISTANCE OF THE CORPS OF ENGINEERS

This report was prepared by Department of the Army, New England Division, Corps of Engineers located in Waltham, Massachusetts. Personnel from the Corps of Engineers office will be available upon request of the state and local governmental agencies to interpret and explain information in the report and to provide other pertinent data which are available.

DESCRIPTION OF PROBLEM

10. LOCATION

The reach of Roaring Brook covered by this study is located in the town of Avon, Connecticut about 3 miles west of its business center. The town is located in Hartford County and is bounded on the north by Simsbury and Canton, on the west by Burlington, on the south by Farmington, and on the east by Bloomfield and West Hartford. In Canton the brook is called Jim Brook which terminates at Secret Lake, from here Roaring Brook flows in a southerly direction adjacent to route 177 and joins the Farmington River in the village of Unionville in the northwest corner of the town of Farmington.

11. DRAINAGE AREA

Roaring Brook has a drainage area of 7 square miles at the Avon-Farmington town line and a drainage area of 2.8 square miles at the Avon-Canton town line. The drainage area is long and narrow having a total length of about 7 miles and an average width of 1 mile (see plate 1).

12. BASIN DESCRIPTION

From Secret Lake to the Avon-Farmington town line the brook flows through a flat wide valley. The average slope of the stream is about 12 feet per mile. From the town line to the Farmington River the brook drops about 30 feet in about one-half mile. In the study area only 3

brooks of any size flow down from the low hills bounding the valley. Because the flat valley is rapidly being filled with residential developments, the inevitable filling, grading and paving will contribute to a more rapid runoff through the numerous storm drains (see photo 1). Three private dams have created small ponds on the brook and at many locations stones have been placed across the brook to form small fish pools (see photo 2).

13. DEVELOPMENT IN THE FLOOD PLAIN

Only a few homes have experienced flooding from past storms. Most of these are located on the eastern shore of Secret Lake at the upper end of the study area. Some of these homes are shown in photo 3. From here downstream several developers have constructed many homes on the west side of Roaring Brook (see photos 4 and 5). At this time only one development crosses the brook (Blueberry Lane), however future plans are to cross the brook at several locations and extend the developments on both banks for a major portion of the stream. None of the new homes built to date will be flooded in a recurrence of the August 1955 storm. However, with the construction of new bridges and houses and without sound engineering advice future flooding is possible. Present indications are that industrial and commercial development will not be extensive in this valley.

14. IMPROVEMENTS

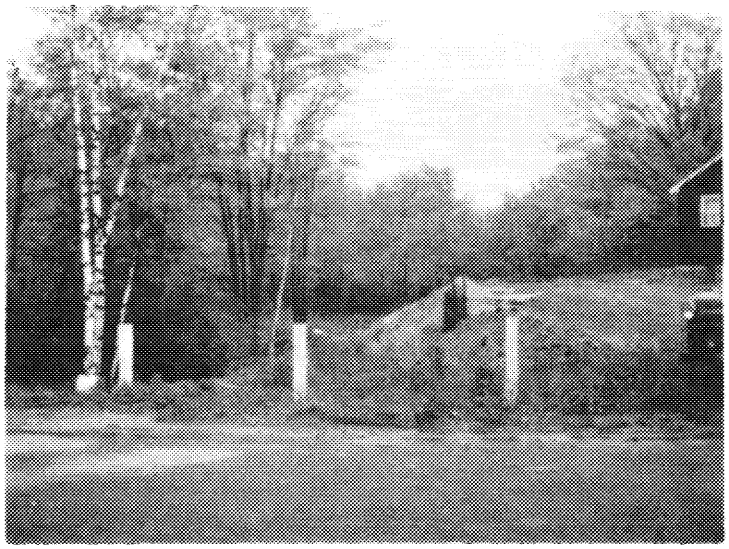
The only improvement that has taken place on the brook has been the straightening of the channel downstream of a small private dam. However, developers' plans indicate that the brook will be relocated in several places in order to better utilize the land adjacent to the waterway.

15. BRIDGES

Except for Country Club Road, Old Wheeler Lane and Blueberry Lane all of the bridges are privately owned. From the results of this study it is evident that all bridges except the one at Blueberry Lane are restrictions and will be inundated in a recurrence of the August 1955 flood. Many of them will be under water in lesser floods (see photos 6, 7, 8 and 9).

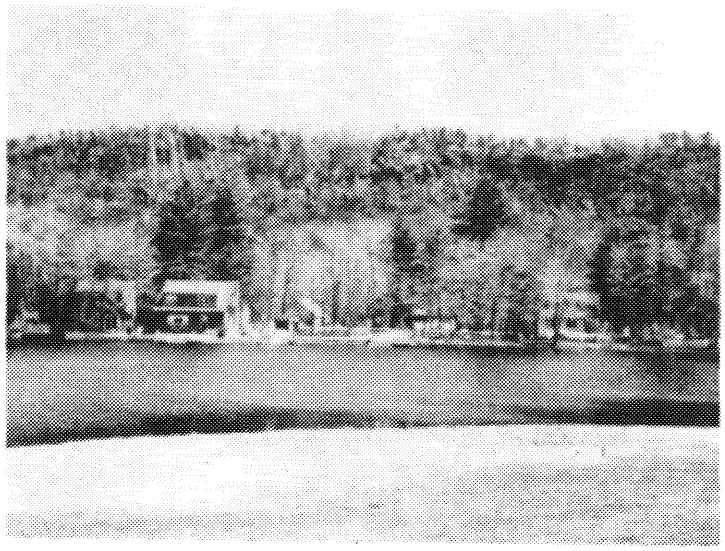
16. DAMS

Three dams are located on Roaring Brook and are shown in photos 10, 11, 12 and 13. The problem of high water at these dams is compounded by the fences which can become debris collectors. Failure of the fences acting as debris dams can cause a surge of high water over the downstream area.

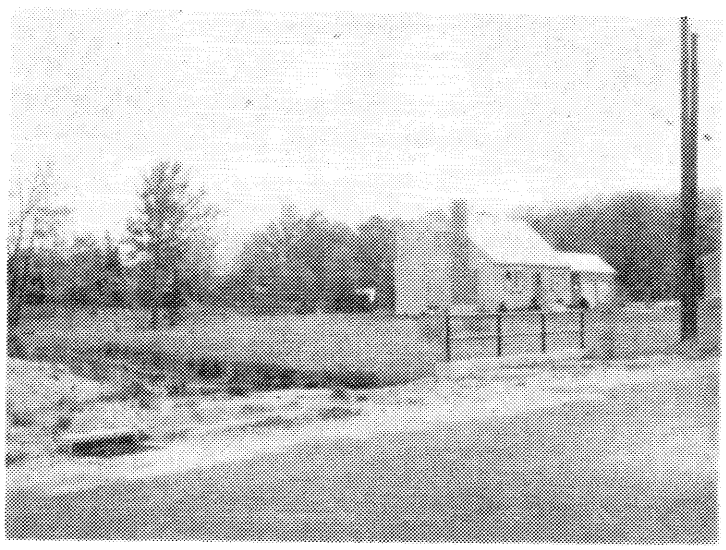


1. Roaring Brook, Avon, Connecticut - Filling, grading and paving adjacent to the brook.

2. Roaring Brook, Avon, Connecticut - Small stone dams create fishing pools.

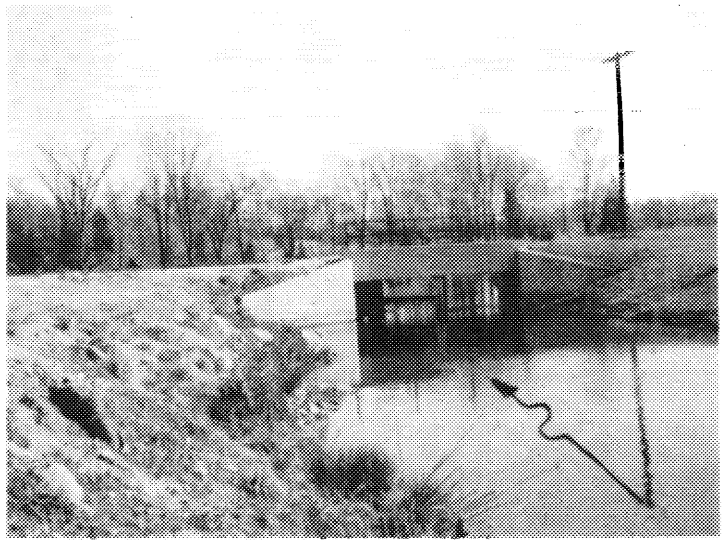


3. Roaring Brook, Avon, Connecticut - Homes on Secret Lake flooded in August 1955. (Water was about 18" over first floors)



4. Roaring Brook, Avon, Connecticut - Home on Blueberry Lane adjacent to brook.

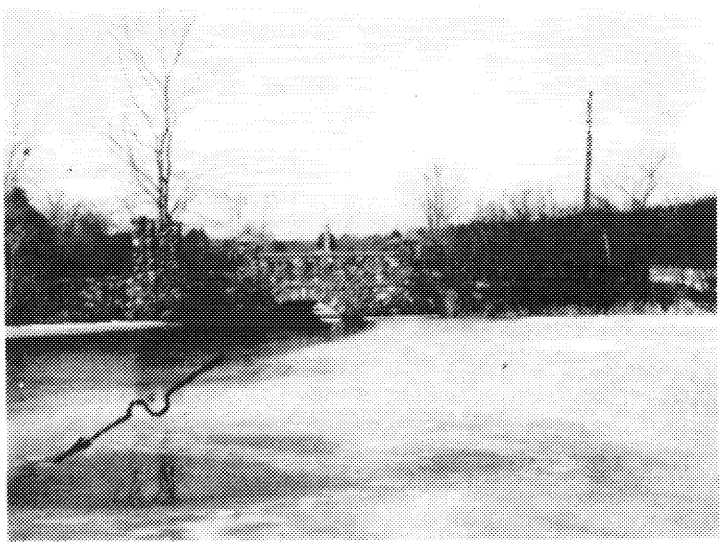
5. Roaring Brook, Avon, Connecticut - Homes on Park View Drive west of brook.



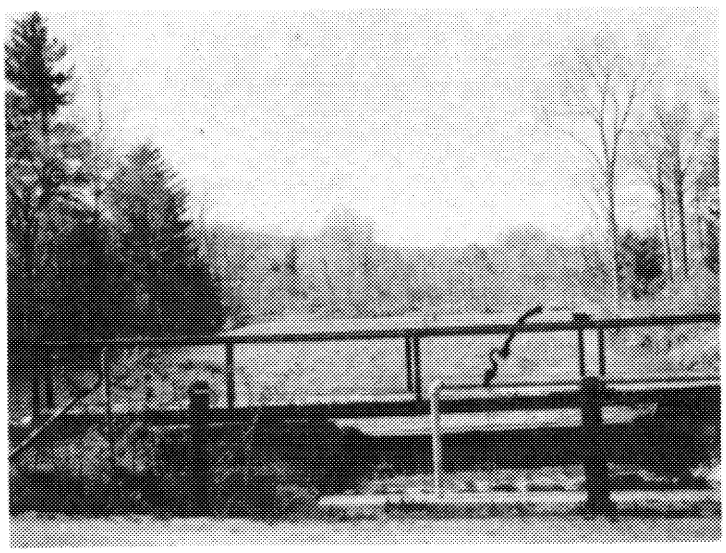
6. Roaring Brook, Avon, Connecticut - Blueberry Lane Bridge.

7. Roaring Brook, Avon, Connecticut - Old Wheeler Lane Bridge.

8. Roaring Brook, Avon, Connecticut - Country Club Road Bridge.

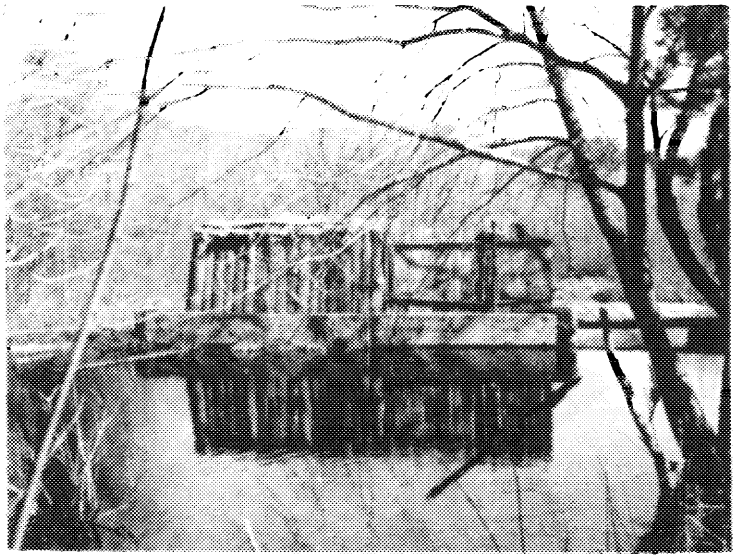


9. Roaring Brook, Avon, Connecticut - Bellosguardo Road Bridge.



10. Roaring Brook, Avon, Connecticut - Private dam adjacent to Country Club Road. (Note wire fence)

11. Roaring Brook, Avon, Connecticut - Private dam downstream from Bellosguardo Road. (Note wire fence)



12. Roaring Brook, Avon, Connecticut - Private dam near downstream limit of study, upstream view. (Note obstructions)

13. Same dam as above, downstream view.

17. FLOOD DAMAGES

Except for the few homes on the eastern shore of Secret Lake the flood of record (August 1955) caused little damage to the then sparsely inhabited valley.

18. EXISTING REGULATION

The town of Avon has used Subdivision Regulations to maintain some control on the development in the flood plain. In general, permits have been granted subject to special conditions determined by Subdivision Regulations or the Planning and Zoning Commission. The town does have the power to adopt additional flood plain ordinances according to authority conferred by chapter 124 of the 1963 supplement to the General Statute. The State of Connecticut enacted legislature in 1963 (Public Act 435) which directs the Connecticut Water Resources Commission to establish encroachment lines beyond which in the direction of the waterway no obstruction or encroachment may be placed except by permit.

BASIC DATA

19. MAPPING

The Corps of Engineers made a topographic survey which extended about 500 feet from both banks of Roaring Brook. Where the flood plain limit was beyond the topographic survey, the data was developed from enlargements of the U. S. Geological Survey quadrangle sheets and modified as necessary by field investigation.

20. PROFILES

The topographic survey mentioned above also included a river bottom survey and measurement of existing bridges and dams. Field investigation yielded very limited high water data for the flood of August 1955. The stationing for the profile along the stream was determined by scaled distances from the final maps.

21. DISCHARGE RECORDS

The U. S. Geological Survey has published records of river stage and streamflow of several locations in the Farmington River watershed for various periods since 1913. However, no data was available for Roaring Brook. The estimates of flow for the flood of record was determined by hydraulic computations at structures and correlated with the records on Burlington Brook. The recorded data at Burlington Brook was also used in the flood frequency analysis.

HYDROLOGY

22. PRECIPITATION

There are no official Weather Bureau precipitation stations in the Roaring Brook watershed. Based on the two nearest precipitation stations, Barkhamsted and Hartford, which are 10 miles north and east, respectively, it is estimated that the average annual precipitation is 44 inches and is uniformly distributed throughout the year. At Barkhamsted, north of Roaring Brook, the average annual precipitation for 29 years of record through 1961 is 45.62. The maximum and minimum annual precipitation for the same period was 57.29 inches in 1945 and 32.06 in 1957.

At Hartford, east of Roaring Brook, the average annual precipitation for 57 years of record through 1961 is 42.81 inches. The maximum and minimum annual precipitation for the same period was 62.94 inches in 1965 and 33.00 in 1941.

23. SNOW

The average annual snowfall has been estimated to be about 41.5 inches. The snow cover reaches a maximum depth in March and has an average water equivalent of about 3 inches over the basin. Snowmelt alone will rarely cause flooding but when augmented by rainfall can create serious damage.

24. STORMS

Storms of three general types have occurred in the Farmington River watershed, namely, cyclonic storms of continental origin, hurricanes of tropical origin and thunderstorms. In small drainage areas such as Roaring Brook, the hurricane storms and thunderstorms which are characterized by intense rainfall over limited areas, cause the more critical flooding.

25. FLOOD HISTORY

In the last 40 years the Farmington River basin has experienced 6 significant floods. These were in November 1927, March 1936, September 1938, December 1948, August and October 1955. On the basis of recorded information on Burlington Brook, it is assumed that Roaring Brook had a similar history with the August 1955 flood the maximum experienced. This flood was the result of about 13.5 inches of rainfall occurring on 17-20 August associated with hurricane "Diane". The precipitation fell on ground that had been saturated the week previously due to about 6 inches of rainfall associated with hurricane "Connie".

26. FLOOD FREQUENCIES

The frequency or percent annual chance of occurrence of peak discharges were developed from the records of the gaging stations on Burlington Brook with the necessary adjustments to compensate for the size and topography of the relative drainage areas. The original frequency data for Burlington Brook was developed from a standard statistical analysis which assumes that the logarithm of the annual peak flows are normally distributed. Table 1 is a summary of discharge, elevation-frequency data for selected locations along Roaring Brook.

27. ANALYSIS OF FLOODS

Due to the limited data available, much of the flood analysis was developed from synthetic floods and then correlated with the high water and flood history of Burlington Brook. It was concluded that Secret Lake and the large swamp area immediately upstream are very effective in reducing floodflows. The drainage area of Roaring Brook from Secret Lake to the Avon-Farmington town line includes two tributary brooks which are primarily responsible for generating floods in that area. The contribution of floodflows from Secret Lake is delayed and becomes less critical downstream of the first brook.

HYDRAULICS

28. WATER SURFACE PROFILES

Hydraulic computations were performed to supplement available data in sufficient detail for purposes of defining water surface elevations throughout the study area. The resulting water surface profiles for the four selected flood discharges reflect the hydraulic characteristics of the existing waterway including reaches of improved and natural channel, bridges and dams.

29. BACKWATER COMPUTATIONS

The water surface profiles were developed from backwater computations, using methods based on Bernoulli's energy theorem and Manning's friction formula, neglecting the effect of debris.

a. Channel losses. Manning's discharge formula used in the derivation of channel losses is:

$$Q = \frac{1.486 A R^{\frac{2}{3}} S^{\frac{1}{2}}}{n}$$

TABLE 1

ROARING BROOK -- AVON, CONNECTICUT

Discharge, Elevation - Frequency Data

Annual Percent Chance	Sta. 8 + 30 Upstream of Dam		Private Road & Dam Sta. 43 + 00		County Club Road Upstream of Dam		Old Wheeler Road	Blue-berry Lane	Private Road Sta. 180 + 50	Secret Lake
	Discharge in c. f. s.	Elevation in feet m. s. l.	D. S. Elev in feet m. s. l.	U. S. Elev in feet m. s. l.	Discharge in c. f. s.	Elev in feet m. s. l.	Elev in feet m. s. l.	U. S. Side Elev in feet m. s. l.	Elev in feet m. s. l.	Elev in feet m. s. l.
20	300	242.45	244.40	248.25	200	270.40	271.25	273.30	277.80	281.25
10	390	242.90	244.95	248.60	270	271.30	272.10	274.50	278.60	282.15
4	535	243.35	245.65	249.10	365	272.30	273.60	275.90	279.40	283.10
2	675	243.65	246.15	249.50	460	272.95	274.45	276.80	280.15	283.80
1	830	243.95	246.60	249.90	560	273.20	274.70	277.55	280.60	284.40
August 1955	1,150	244.40	247.30	250.60	800	273.80	275.35	278.85	281.35	285.40

Where Q = discharge in cubic feet per second
A = cross sectional flow area in square feet
n = channel roughness coefficient
R = hydraulic radius (ratio of area to wetted perimeter)
S = slope of hydraulic gradient in feet per foot

b. Bridge losses. Head losses at bridges were computed by use of the D'Aubuisson formula and the submerged orifice formula.

(1) The D'Aubuisson formula is:

$$H = \left[\left(\frac{Q}{KDW}\right)^2 - V_1^2\right]\frac{1}{2g}$$

Where H = head loss in feet
Q = discharge in cubic feet per second
D = depth of water downstream in feet
W = width of waterway opening in feet
V_1 = velocity of approach in feet per second
g = acceleration of gravity (32.2 feet per second^2)
K = coefficient of contraction (0.85 to 0.95)

(2) The submerged orifice formula for use when a bridge becomes submerged is:

$$H = \left(\frac{Q}{CA\sqrt{2g}}\right)^2 - \frac{V^2}{2g}$$

Where H = head loss in feet
Q = discharge in cubic feet per second
A = area of waterway opening
V = velocity of approach
C = coefficient of contraction
g = acceleration of gravity

c. Dams. Flow over dams was computed using the classical weir formula.

$$Q = CLH^{\frac{3}{2}}$$

Where Q = discharge in cubic feet per second
C = discharge coefficient
L = length of weir in feet
H = height of water above weir in feet

30. BRIDGES

Critical bridge elevations and their relationship to the recurrence of the August 1955 flood are summarized in Table 2. It is evident from

TABLE 2

ROARING BROOK BRIDGE DATA

Identification	Station	Floor Elevation	Clearance Elevation	1955 Flood Elevation	Clearance Below 1955 Flood Elevation
Private Road	8+00			244.1	
Private Road	43+00	246.9	245.5	250.2	4.7
Bellosguardo Road	50+70	250.9	249.2	250.7	1.5
Private Road	77+40	254.6	253.3	257.3	4.0
Private Road	84+60	259.4	259.0	260.0	1.0
Country Club Road	104+60	272.7	269.3	273.8	4.5
Old Wheeler Road	122+80	273.7	272.7	275.2	2.5
Blueberry Lane	136+60	279.0	276.3	278.9	2.6
Private Road	150+60	275.9	277.2	279.6	2.4
Private Road	156+60	276.0	277.2	280.0	2.8
Private Road	180+50	279.2	278.2	281.5	3.3

an inspection of this table and an examination of the plans and profiles on plates 2 through 9, that all of the bridges are below the flood height of the 1955 flood except Blueberry Lane and Bellosguardo Road bridges. However, because of the low approaches to the Bellosguardo Road bridge the road will be inundated during periods of major flooding.

31. ESTIMATED LIMITS OF FLOODING

The water surface profiles indicating the elevations associated with the four selected flood discharges are shown on plates 7 through 9. It is noted that the 1 and 2 percent annual probability floods and the August 1955 profiles are fairly close together. The estimated limits of flooding, indicated on plates 2 through 6, were determined by relating the water surface elevations to the topography of adjacent land throughout the study area. The limits of flooding are shown for the August 1955 flood and the 2 percent annual probability flood.

32. The depth of flooding at various locations is indicated on typical cross sections shown on plate 10. Through use of the information on plates 2 through 10, the estimated or approximate limits of flooding can be obtained. To determine the actual depth of flooding for a specific property, it is suggested that standard survey methods be employed to obtain detailed elevations of the ground.

33. USE OF RESULTS

The flood hazards related to individual properties can be determined by use of the maps, profiles and cross sections included in this report. The extent of flooding as shown on the maps is approximate since it was necessary to interpolate between contour intervals of 2 feet. Therefore, elevations on the profiles and cross sections should be used to determine the depth of flooding for a particular location. The bench marks and bridge elevations should make this readily feasible. It should be noted that improvements or restrictions in the flood plain may alter the locations of any established flood line. In this respect, any reduction of existing bridge or culvert openings due to pipeline crossings, debris or vegetation should not be permitted without recognizing its effect upstream. There is additional data on intermediate floods, cross sections and bench marks available in the New England Division office.

GUIDELINES FOR USE OF FLOOD PLAIN AND FOR REDUCING FUTURE FLOOD DAMAGE

34. GENERAL

A major portion of this land in the flood plain is as yet undeveloped. Attention must be focused on safeguarding existing structures from flood

damages and on regulating the type of future development. Existing structures may warrant protection by structural works of improvement (i.e. walls, dikes or channel improvements) if economically feasible or by floodproofing measures. Protection of future developments is contingent upon regulations governing the type of development permissible consistent with optimum economic use of the land within a community. Regulations administered by a municipality should have a sound technical and legal basis so as to preclude misuse of the flood plain which in time of flood could result in damages affecting the economy of the entire community.

35. Development within a community should adhere to a general plan to meet the various needs of the residents. In some instances, development on the flood plains may be contemplated. Careful consideration should be given to factors both beneficial and detrimental to the economic feasibility of permitting development on flood plains. Too often, the detrimental effects are overlooked when estimating the value of developing a building site in the flood plain. Some of these detrimental factors which may not receive proper consideration are: (a) effect of filling, (b) flood losses, (c) cost of protective measures, (d) cost of floodproofing, and (e) cost of insurance. It, therefore, appears that some sort of local guidance or control is desirable to insure that the proper consideration is given to developing a flood plain. In addition, such control could prevent damage to innocent parties located upstream or downstream who could suffer through acts of others.

36. FILLING OF THE FLOOD PLAIN

Regulations to control filling of a flood plain are the most difficult to define. This difficulty arises unless a complete long range plan of development for use of the flood plain has been evolved. Too often permits for filling are reviewed by local Boards on piecemeal basis which independently may not appear serious, yet combined could aggravate the flood problem of a community. The Connecticut State Act 435 recognizes the problem and requires that applications be reviewed ". . . with due consideration given to the results of similar encroachments constructed along the reach of waterway."

37. The problems of filling are twofold. First, the filling of a flood plain can reduce the cross section of the valley which can become a restriction, and thereby raise the river stages upstream for any given discharge. Second, the filling can aggravate conditions downstream. This happens when the filling of a large swamp or marshy area is permitted. In this case, the valley is generally very broad so it is possible to fill and still leave a waterway area large enough for the passage of a flood without increasing river stages upstream. However, the act of filling has eliminated a natural flood control reservoir which benefited downstream communities. This loss of natural storage means that in a

recurrence of a particular storm, the runoff potential has increased, thereby creating a higher discharge downstream. Filling, if uncontrolled, could eventually worsen downstream floods. Therefore, any potential filling should be analyzed for its effect on conditions both upstream and downstream.

38. FLOOD PLAIN REGULATIONS

Both channel encroachment lines and flood plain zoning should be established to reduce future flood damages. The ultimate goal of these regulations is to provide for the highest type land use consistent with the flood threat. These controls can be implemented by the use of specific regulations, such as subdivision regulations, building codes and local ordinances. For these controls to be effective, it is necessary that there be public understanding of the general problem, degree of risk, and the available alternate actions. The regulations must be clearly defined so that any landowners involved can evaluate the benefits he will derive along with the rest of the community.

39. CHANNEL ENCROACHMENT LINES

The establishment of channel encroachment lines regulates any activity, building, filling or encroachment within such lines which could impede the free discharge of the stream or reduce channel storage, thereby causing harm to others. Such work, if undertaken, would be administered by the Connecticut Water Resources Commission.

40. FLOOD PLAIN ZONING

At such time as the town of Avon establishes zoning bylaws along Roaring Brook, one of the provisions should include flood plain zones. The town is granted that authority under the Zoning Enabling Act of the General Laws of the State of Connecticut. References for procedures in establishing such an ordinance are listed in the Bibliography. The best long range use of land and the area development should be the aim of such an ordinance. This can be developed through studies by local planning groups. Recognizing the degree of risk involved, consideration should be given to retaining land adjacent to the river for open space use, such as parking areas, parks, and recreation areas. Any structure permitted should be of the type that would not normally be used for habitation and could be submerged without serious consequence. On the higher elevation of the flood plain, structures for commercial or industrial use might be permitted, provided that the structure is not of such size to be a serious encroachment on the cross section of the valley and provided that the first usable floor is above the limit of prescribed elevation.

41. SUBDIVISION REGULATIONS

With zoning regulating use of the flood plain, subdivision regulations should be established to minimize the flood hazards to uses permitted in the flood plain.

42. BUILDING CODES

Local building codes and Planning Board Regulations should be developed to enforce the requirements of minimum elevations for first floors or basements. These rules could provide a minimum requirement concerning the safety of the structure for the preservation of life and health. This can be accomplished by requiring that a permit will not be issued for construction in a flood prone area unless the hazard is eliminated by providing adequate drainage facilities, by a protective wall, by suitable fill, by raising floor levels of the buildings, by floodproofing, or by combinations of these methods.

43. MUNICIPAL USE

One way of controlling the flood plain use is for the town to acquire land as it becomes available and to convert it to recreational or other uses which would not experience significant damage by periodic flooding.

44. FLOODPROOFING OF STRUCTURES

There is much that individual owners can do to reduce flood damages to commercial and industrial properties that are presently located in the flood plain. Some of these measures are: (a) controlling seepage through walls, (b) installing gates and valves on sewer and drainage lines, (c) anchoring of small or light structures to foundations, (d) permanently closing unnecessary openings in walls, (e) protecting foundations of buildings which might be subject to undermining, (f) protecting interior contents by elevating, covering or coating, and (g) preparing schedules for evacuation of movable contents.

45. FINANCIAL CONTROL

Banks and financial lending institutions can assist in controlling development in the flood plain by denying funds for development or construction in flood prone areas. Similarly, insurance companies can limit their coverage of structures existing or proposed for construction in the flood plain.

46. FLOOD WARNING

On streams as small as Roaring Brook, it is impossible to establish a flood-warning service such as the Weather Bureau provides for the larger drainage basins. The most that can be expected from the Weather Bureau at Bradley Field would be a regional forecast of "possible flash flooding in small streams in central Connecticut." With this type of warning, the Police Department or a local Civil Defense office would be on an alert status. Staff gages installed by local interests at two or three locations along the river would provide a visual index of the rate of rise. It would then be possible to prescribe critical elevations at which time certain areas should be evacuated before the flood was at its worst.

47. CHANNEL MAINTENANCE

Another effort by which the town could help keep the level of the floods down is to maintain continuous surveillance of the stream to prevent unauthorized dumping, remove fallen trees that may become temporary debris dams and keep bridge openings clear of debris or vegetative growth.

CONCLUSIONS

48. GENERAL

Only minor misuse of flood plains has taken place. The report and accompanying drawings indicate the flood plain areas subject to pontential flood damages. Judicial use of this information in implementing proper flood plain regulations can be of great value in achieving orderly future growth of the community and preclude the need for additional costly flood control improvements.

REMI O. RENIER
Colonel, Corps of Engineers
Acting Division Engineer

GLOSSARY

BUILDING CODE. A collection of regulations adopted by a local governing body setting forth standards for the construction of buildings and other structures for the purpose of protecting the health, safety, and general welfare of the public.

CHANNEL. A natural or artificial watercourse with definite bed and banks to confine and conduct continuously or periodically flowing water.

DISCHARGE. (Rate of Flow). The quantity of water passing along a stream per unit of time such as cubic feet per second.

DRAINAGE AREA. The area (acres, square miles, etc.) from which water is carried off by a drainage system.

ENCROACHMENT LINES. Lateral limits or lines along streams or other bodies of water, beyond which in the direction of the stream or other body of water no structure or fill may be added without a permit.

FLOOD. Any temporary rise in streamflow or stage that results in significant adverse effects in the vicinity.

FLOOD OF RECORD. Any flood for which there is reasonably reliable data useful in technical analyses. Ordinarily the term is used to refer to "maximum flood of record."

FLOOD PEAK. The highest value of the stage or discharge attained by a flood; thus, peak stage or peak discharge.

FLOOD PLAIN. The relatively flat lowlands adjoining a watercourse or other body of water subject to overflow therefrom.

FLOOD PLAIN REGULATIONS. A general term applied to the full range of codes, ordinances, and other regulations relating to the use of land and construction within flood plain areas. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment laws, open area regulations, and other similar methods of control affecting the use and development of flood plain areas.

FLOOD PROFILE (BACKWATER PROFILE). The longitudinal profile assumed by the surface of a stream of water flowing in an open channel.

FLOOD PROOFING. A combination of structural changes and adjustments to properties subject to flooding primarily for the reduction or elimination of flood damages.

FLOOD VOLUME. The total volume of runoff during a flood, which is equal to the average rate of flow multiplied by time (flood duration). The term "inches runoff" is sometimes used to designate flood volume, which means that the flood volume would cover the drainage area above the point of measurement to a uniform depth equal to the number of inches specified.

FLOODWAY.

(1) Designated. The channel of a stream and that portion of the adjoining flood plain designated by a regulatory agency to provide for reasonable passage of floodflows.

(2) Natural. The channel of the stream or body of water and that portion of the flood plain that is used to carry the flow of the flood.

GAGE.

(1) A staff graduated to indicate the elevation of a water surface.

(2) A device for registering water levels.

GAGING STATION. A selected section in a stream equipped with a gage and facilities for measuring the flow of water; a place on a stream where data are gathered by which continuous discharge records may be developed.

HISTORICAL FLOOD. A known flood which occurred before systematic recordkeeping was begun for the stream or area under consideration.

LEVEE. A dike or embankment for the protection of lands from inundation.

MAXIMUM KNOWN FLOOD. The largest known flood which has occurred in a region whether it is an historical flood or a flood of record.

WATERSHED. The area drained by a stream or stream system.

ZONING ORDINANCE. An ordinance adopted by a local governing body, with authority from a state zoning enabling law, which under the police power divides an entire local governmental area into districts and, within each district, regulates the use of land, the height, bulk, and use of buildings or other structures, and the density of population for the purpose of protecting the health, safety and general welfare of the public.

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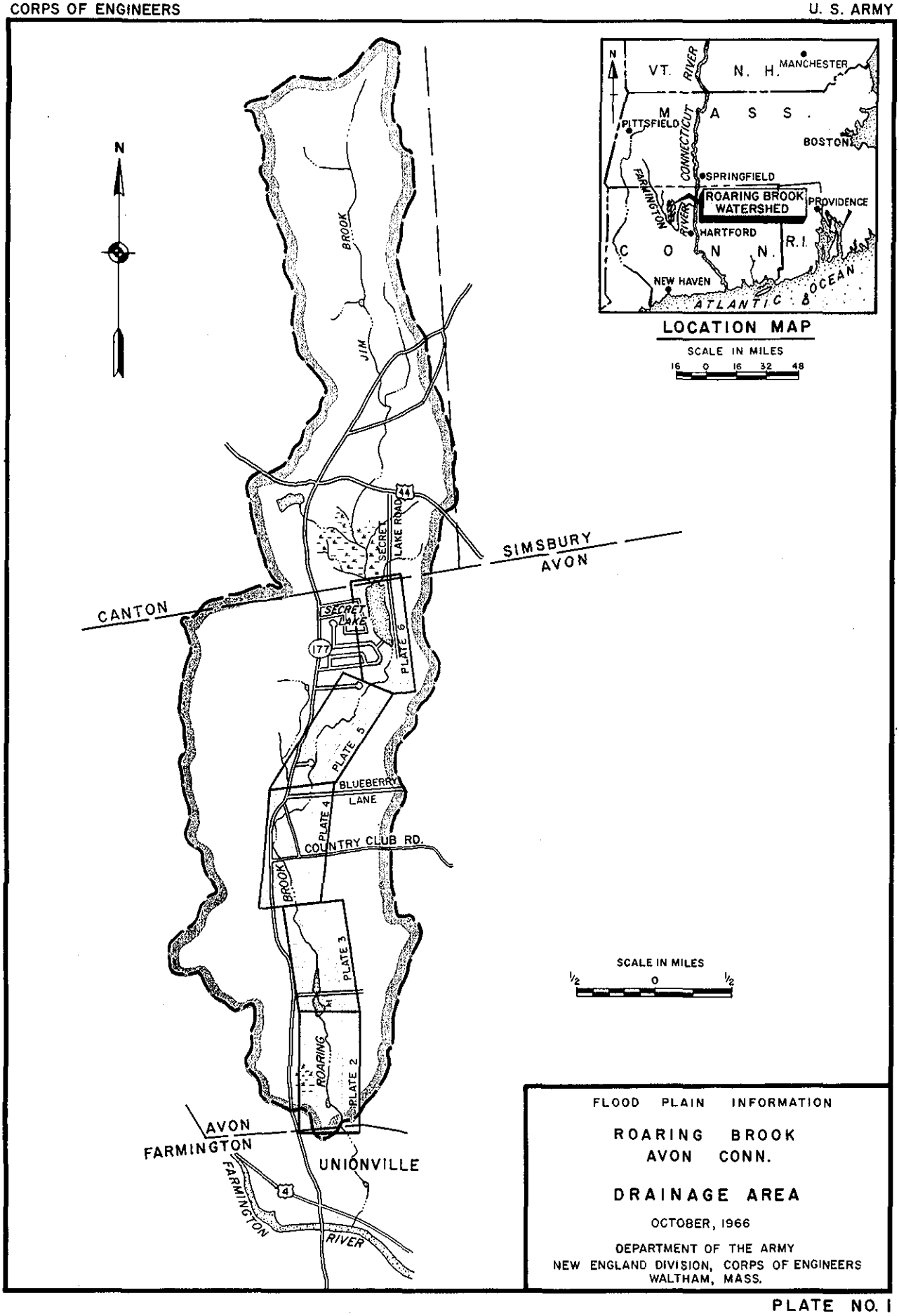


FLOOD PLAIN INFORMATION

ROARING BROOK
AVON CONN.

DRAINAGE AREA

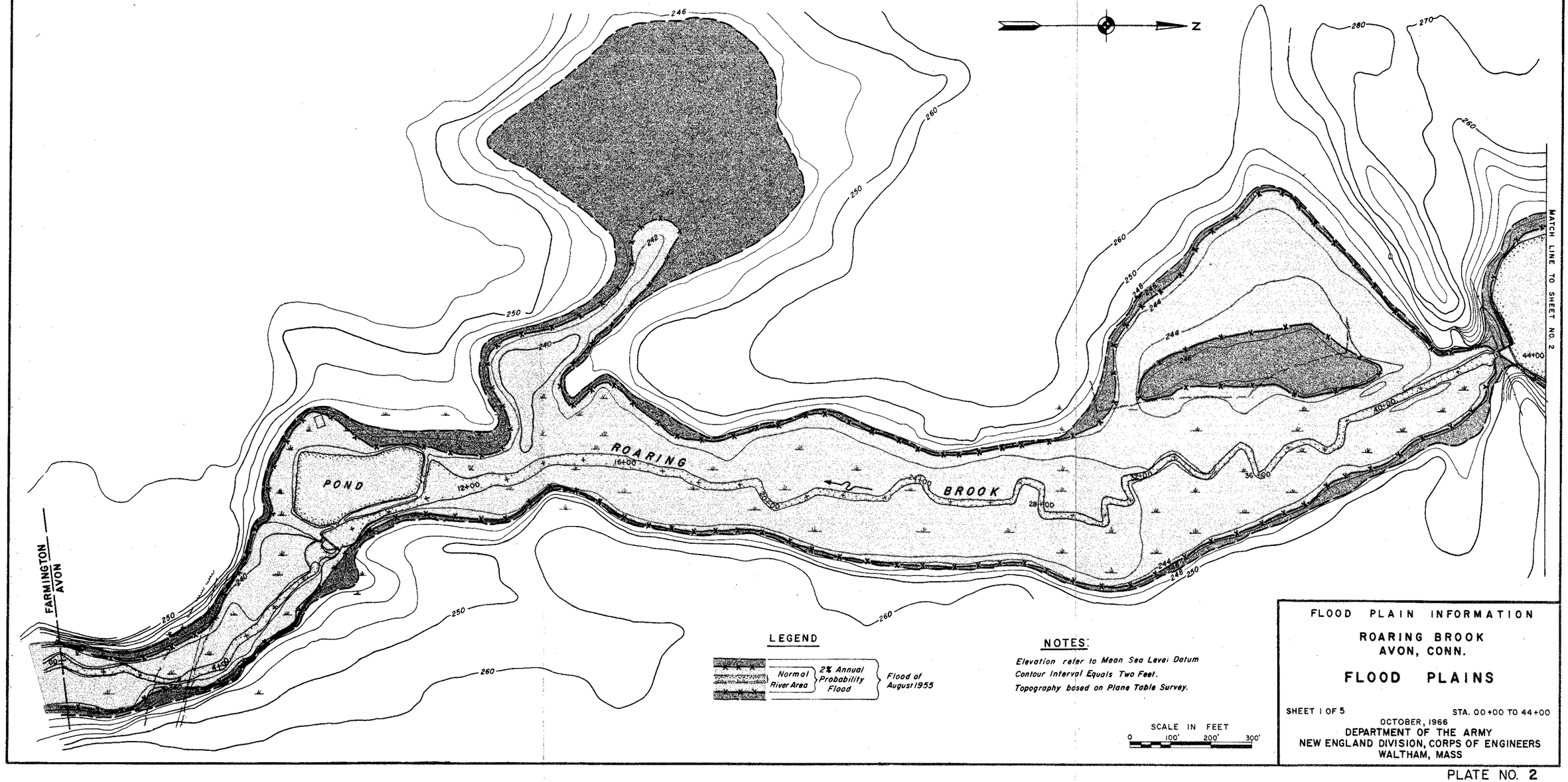
OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 1

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

Normal River Area / 2% Annual Probability Flood / Flood of August 1955

NOTES:

Elevation refer to Mean Sea Level Datum
Contour Interval Equals Two Feet.
Topography based on Plane Table Survey.

SCALE IN FEET
0 100' 200' 300'

FLOOD PLAIN INFORMATION

ROARING BROOK
AVON, CONN.

FLOOD PLAINS

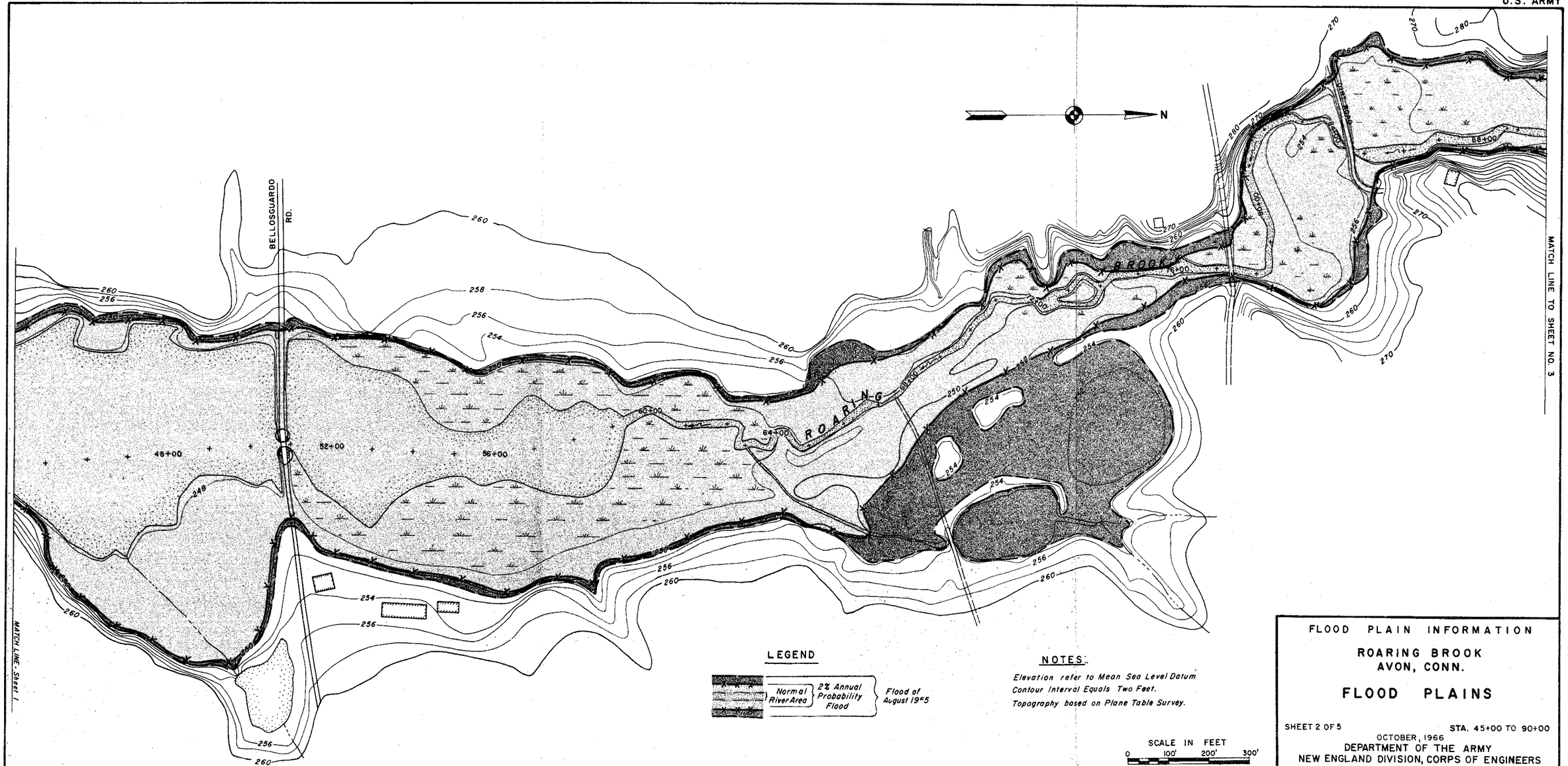
SHEET 1 OF 5 STA. 00+00 TO 44+00

OCTOBER, 1966
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS

PLATE NO. 2

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

Normal River Area; 2% Annual Probability Flood; Flood of August 1955

NOTES:

Elevation refer to Mean Sea Level Datum

Contour Interval Equals Two Feet.

Topography based on Plane Table Survey.

SCALE IN FEET

0 100' 200' 300'

FLOOD PLAIN INFORMATION

ROARING BROOK
AVON, CONN.

FLOOD PLAINS

SHEET 2 OF 5 STA. 45+00 TO 90+00

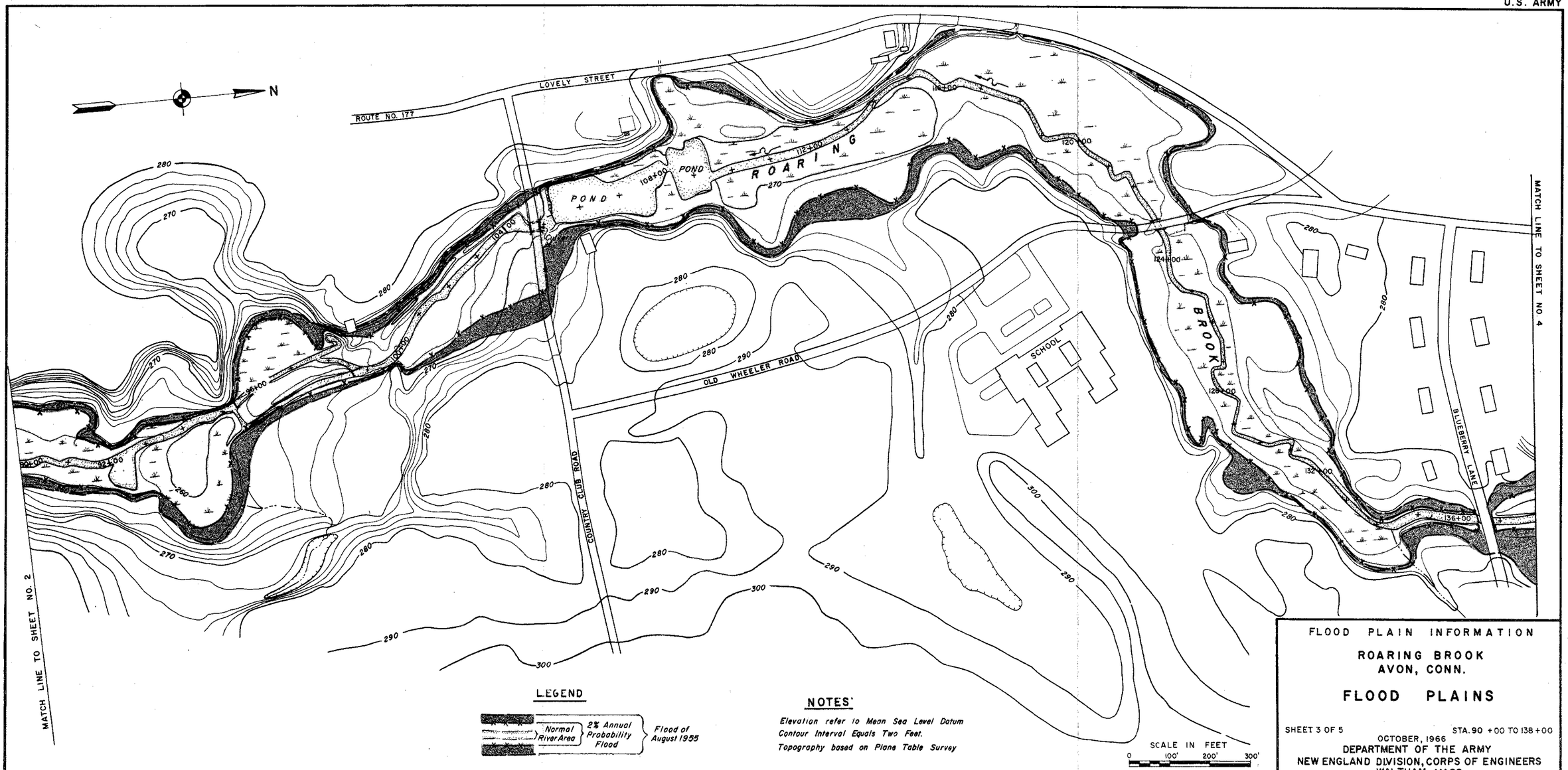
OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 3

CORPS OF ENGINEERS

U.S. ARMY



FLOOD PLAIN INFORMATION

ROARING BROOK
AVON, CONN.

FLOOD PLAINS

SHEET 3 OF 5 STA. 90 +00 TO 138 +00

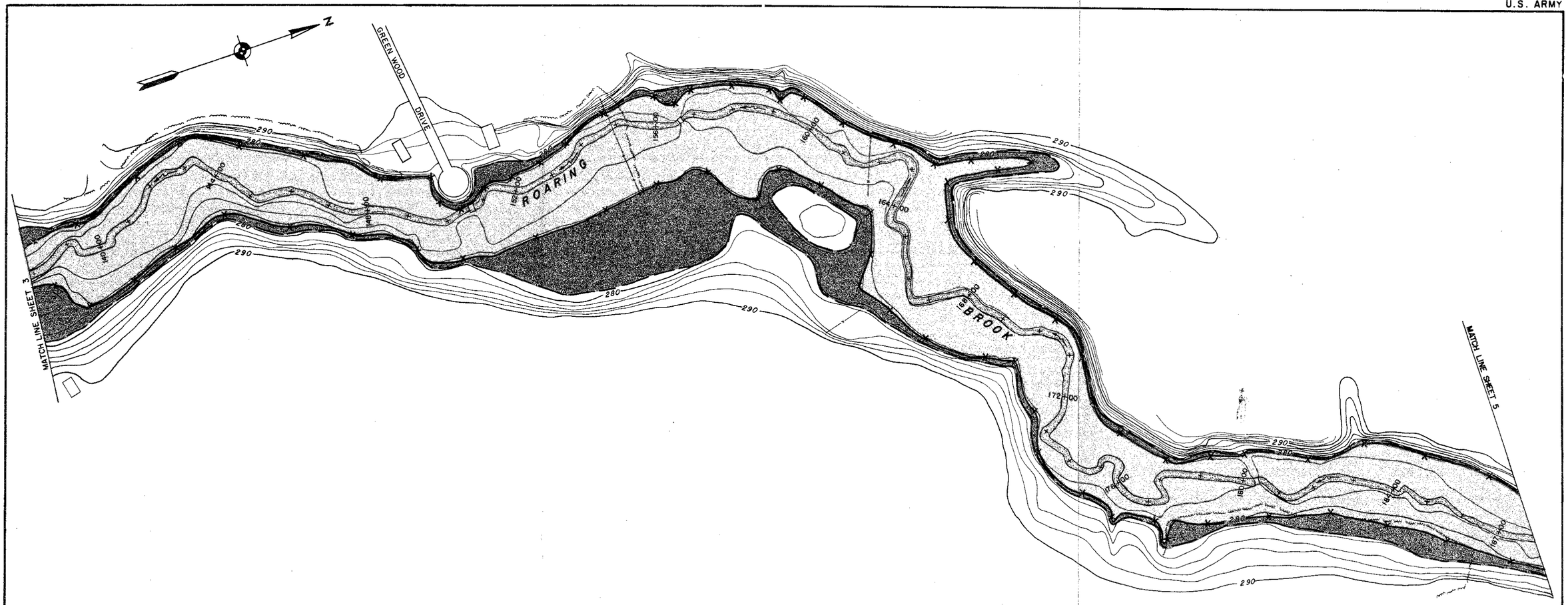
OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 4

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

Normal River Area
2% Annual Probability Flood
Flood of August 1955

NOTES:

Elevation refer to Mean Sea Level Datum
Contour Interval Equals Two Feet.
Topography based on Plane Table Survey.

SCALE IN FEET
0 100' 200' 300'

FLOOD PLAIN INFORMATION

ROARING BROOK
AVON, CONN.

FLOOD PLAINS

SHEET 4 OF 5

STA. 138+00 TO 187+00

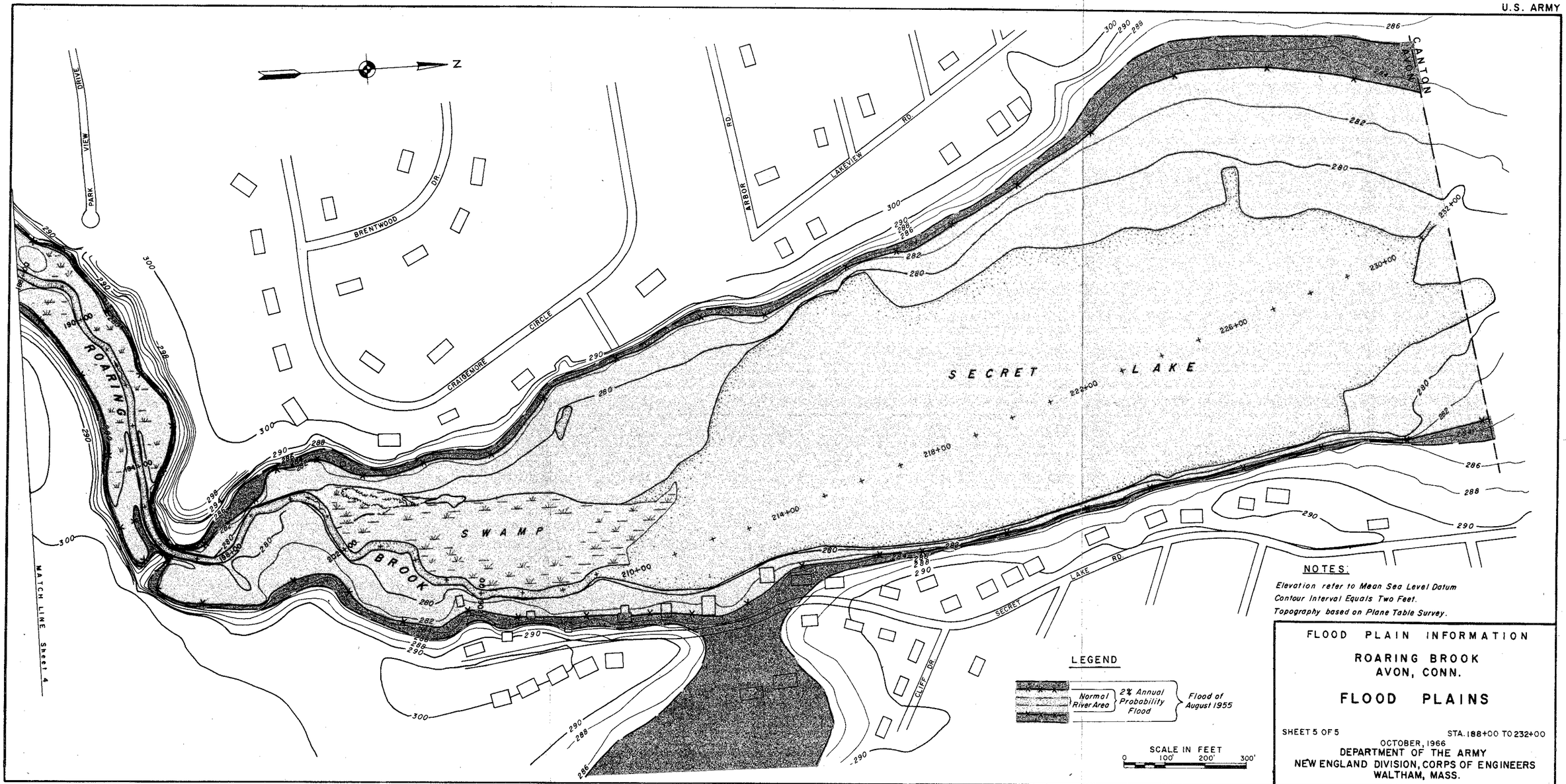
OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 5

CORPS OF ENGINEERS

U.S. ARMY



NOTES:

Elevation refer to Mean Sea Level Datum
Contour Interval Equals Two Feet.
Topography based on Plane Table Survey.

LEGEND

Normal River Area | 2% Annual Probability Flood | Flood of August 1955

SCALE IN FEET
0 100' 200' 300'

FLOOD PLAIN INFORMATION

ROARING BROOK
AVON, CONN.

FLOOD PLAINS

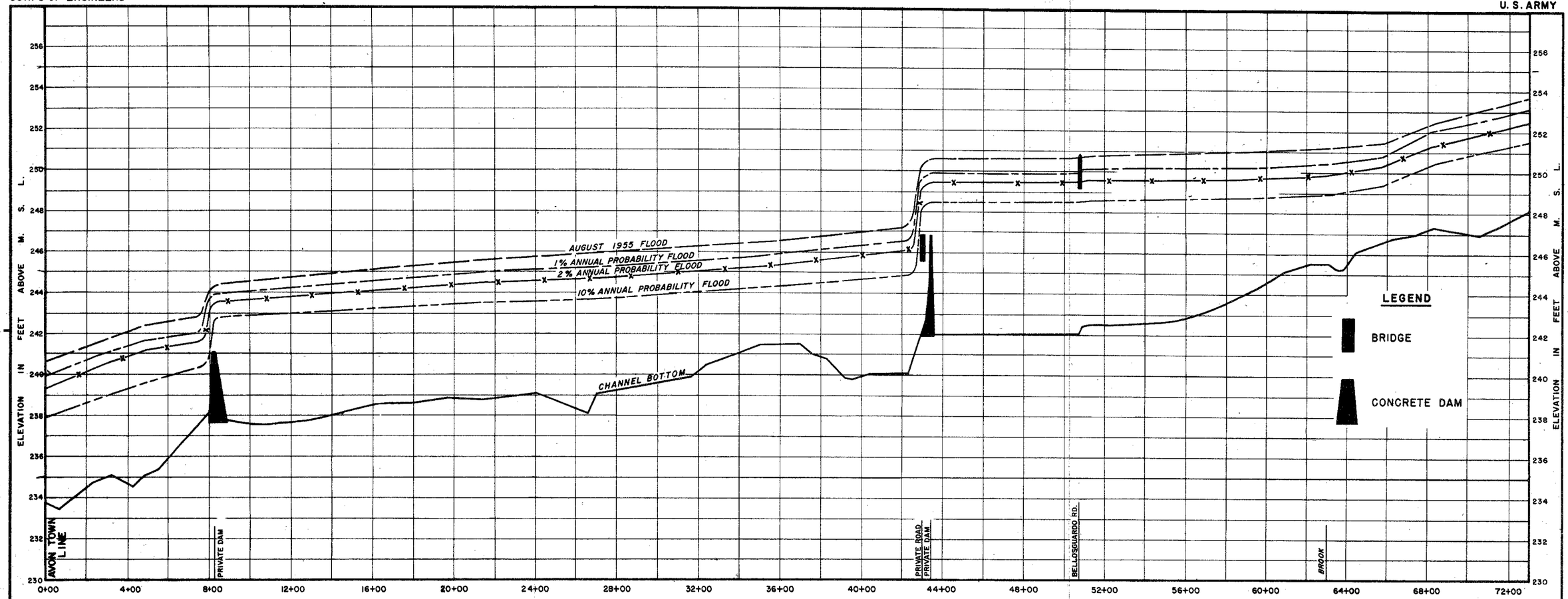
SHEET 5 OF 5 STA. 188+00 TO 232+00

OCTOBER, 1966
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 6

CORPS OF ENGINEERS

U. S. ARMY



DISTANCE IN HUNDRED FEET FROM AVON - FARMINGTON TOWN LINE

FLOOD PLAIN INFORMATION
ROARING BROOK
AVON, CONN.

FLOOD PROFILES

SHEET 1 OF 3 STA. 0+00 TO 73+00

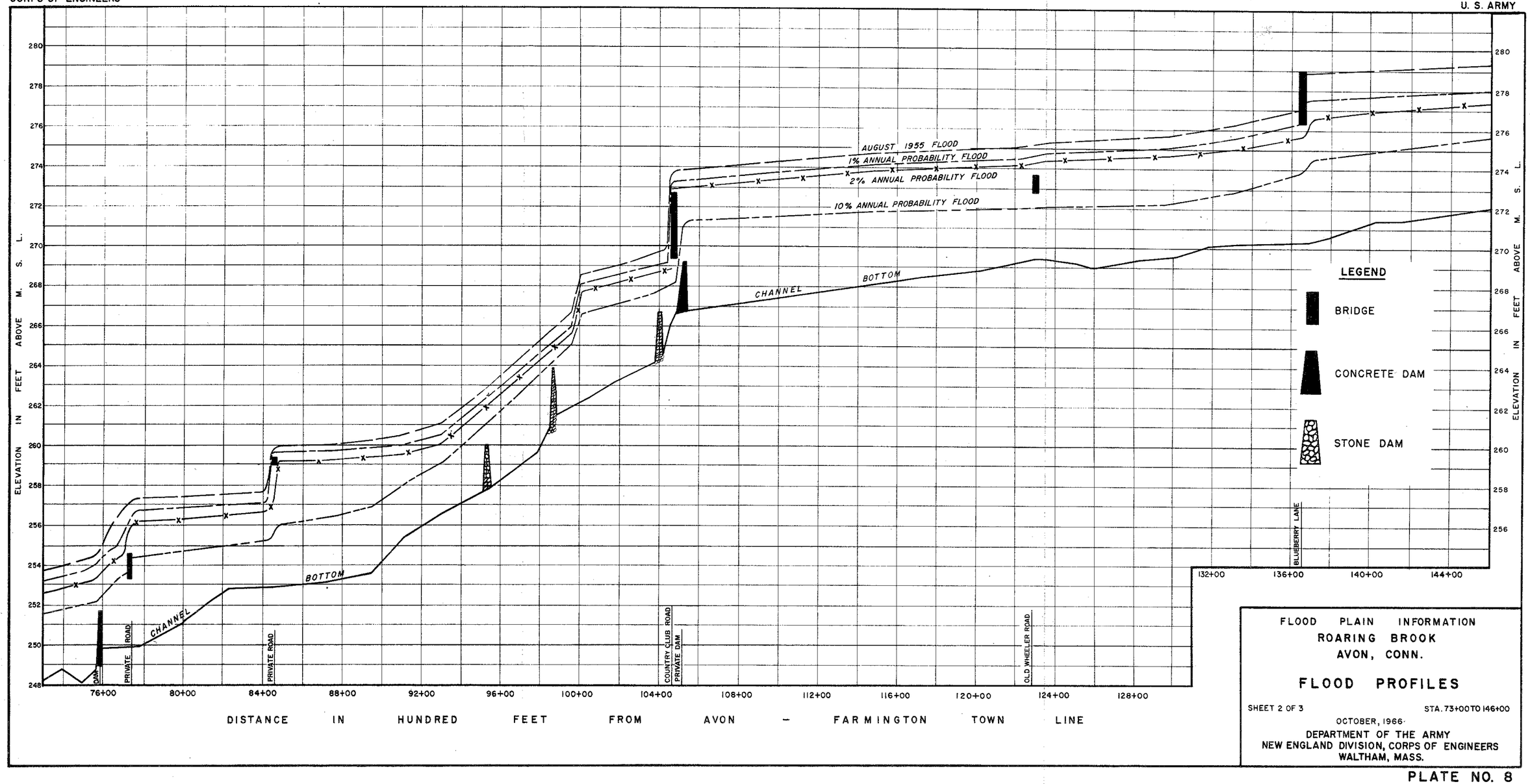
OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 7

CORPS OF ENGINEERS

U. S. ARMY



FLOOD PLAIN INFORMATION
ROARING BROOK
AVON, CONN.

FLOOD PROFILES

SHEET 2 OF 3 STA. 73+00 TO 146+00

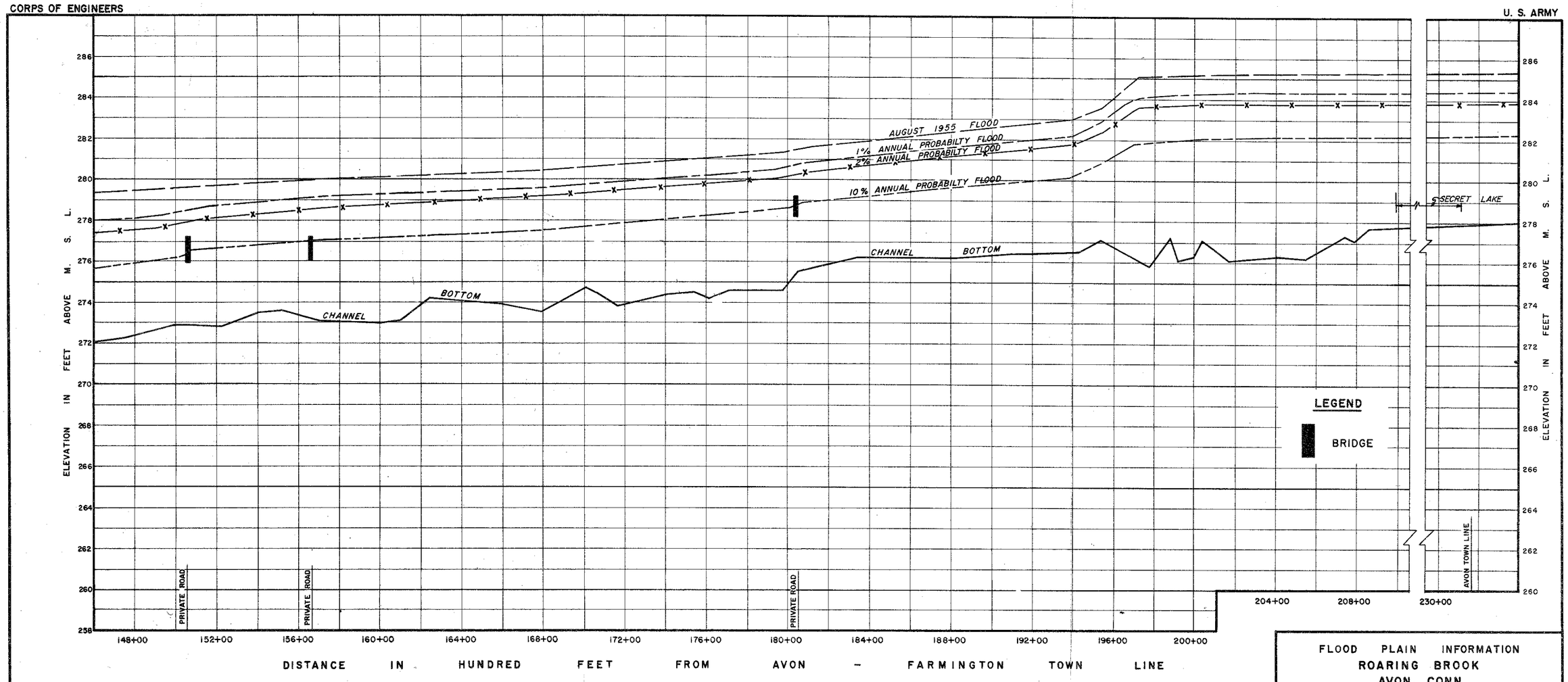
OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 8

CORPS OF ENGINEERS

U. S. ARMY



FLOOD PLAIN INFORMATION
ROARING BROOK
AVON, CONN.

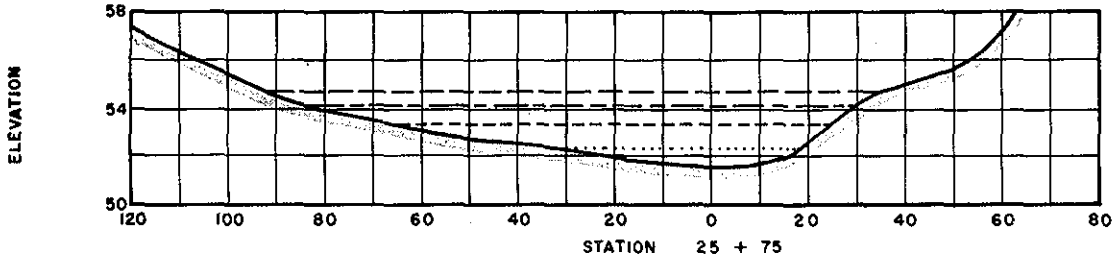
FLOOD PROFILES

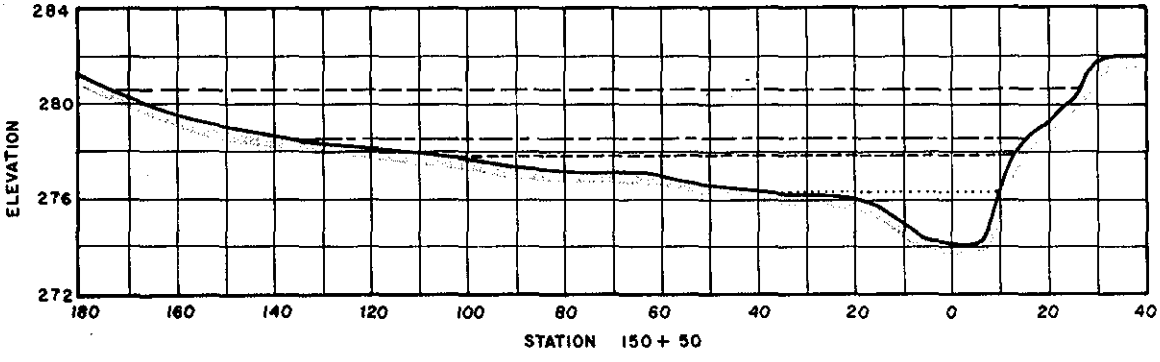
SHEET 3 OF 3 STA.146+00 TO234+00

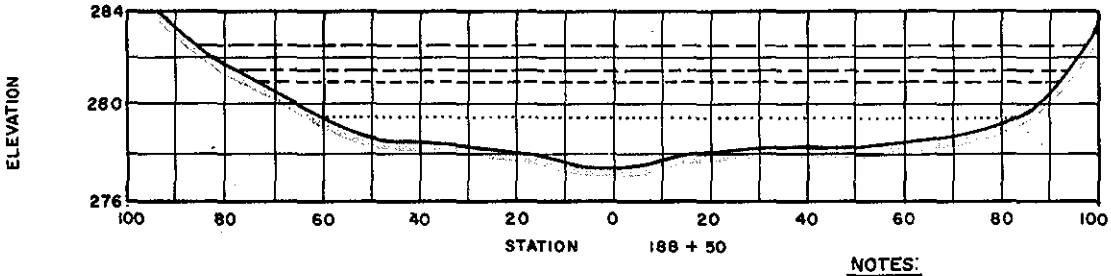
OCTOBER, 1966

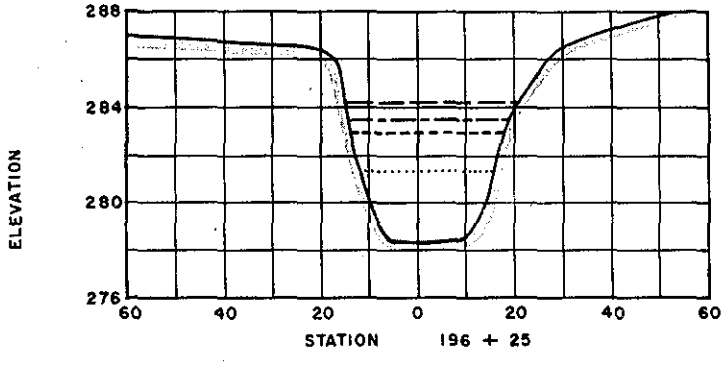
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 9









NOTES:

Sections taken looking downstream.
Horizontal distances in feet.
Elevations in feet (Mean Sea Level Datum.)

LEGEND:

- *August 1955 Flood*
- *1% Annual Probability Flood*
- *2% Annual Probability Flood*
- *10% Annual Probability Flood*

FLOOD PLAIN INFORMATION
ROARING BROOK
AVON, CONN.

TYPICAL CROSS SECTIONS

OCTOBER, 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. 10